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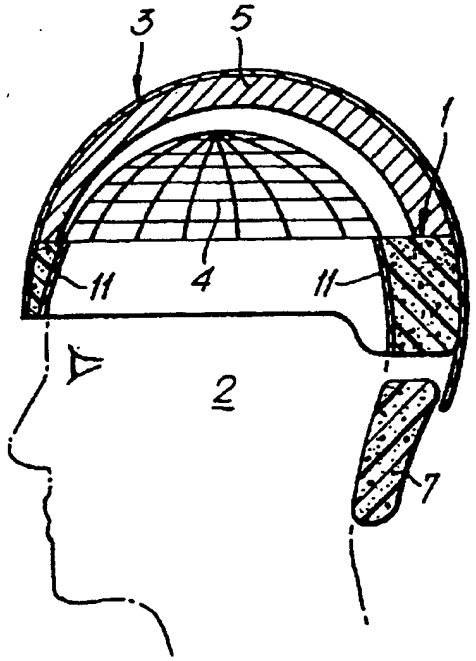
(54) Helmets.

(57) A helmet incorporating a suspension arrangement for supporting the helmet shell (3) on a wearer's head (2) comprising a ring (1) of light, stiff material having an internal surface matched to the wearer's head and an external surface which fits against a part of the internal surface of the helmet shell and is detachably secured thereto.

Fig.2B.



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This invention relates to helmets, and especially to helmets designed to carry equipment forming part of a head-up display system. Such systems normally incorporate an optical unit arranged to display to an observer an image of display material superimposed on a direct view of the surroundings, and are commonly used in aircraft, the display material being, for example, instrument readings, radar presentations, maps or possibly an intensified image of the scene viewed by the observer, as well as other information.

In the case of helmet mounted displays the display equipment carried by the helmet can be bulky and somewhat heavy, which could make the helmet uncomfortable for the wearer.

An object of the invention is to provide means of alleviating this problem, although the invention has other advantages as will be apparent from the following description. Moreover the invention is not restricted to use with helmets forming part of helmet mounted displays but could have application to helmets employed for other purposes.

According to the invention in its broadest aspect a helmet comprises a helmet shell, and a suspension arrangement for supporting the helmet shell on a wearer's head, the suspension arrangement comprising a light-weight relatively stiff ring, having an internal surface which is matched to, so as to fit closely around, the wearer's head, and an external surface which engages a co-operating part of the surface of the helmet shell, and means for detachably securing the ring to the shell.

The ring is preferably formed of expanded polystyrene or polypropylene or similar low density plastics material, and conveniently carries on its internal surface a layer of soft padding material, for example a foam rubber or plastics material, to form a cushion against the wearer's head may be accomplished either by custom trimming the inner surface of a common ring blank, or by selection from a number of differently sized rings.

By arranging for the ring, which may be termed a form fitting ring, to be detachably secured to the helmet shell, a ring individual to a particular wearer may be attached to any helmet shell he is required to wear. Conversely, any one helmet shell may be used by any individual wearer by fitting that wearer's ring in the helmet shell.

The ring may be secured to the helmet shell by means of a hook and loop fastener system, that is to say a fastening system as commonly known under the trade name Velcro, although other forms of releasable securing means may alternatively be employed.

The ring may support other items of the helmet system, such as ear-cups for accommodating ear pieces of intercommunication/radio equipment and a nape-pad, means conveniently being provided for adjusting the positions of these devices to suit the wearer.

The invention also provides a suspension arrangement for supporting a shell of a helmet on a wearer's head comprising a light weight relatively stiff ring having an internal surface matched, so as to fit closely around the wearer's head, and an external surface shaped to engage and arranged to be detachably secured to a part of the internal surface of the helmet shell.

The invention also provides a method of adapting a helmet to fit a particular wearer's head comprising providing a light-weight relatively stiff ring having an internal surface matched, so as to fit closely around that particular wearer's head, and detachably securing the ring within the helmet.

The invention is primarily applicable to helmets fitted with display equipment for head-up display systems especially for use by aircrew.

One helmet suitable for such use and form fitting means therefore will now be described by way of example with reference to Figures 1 to 6 of the accompanying schematic drawings, in which;

Figure 1 illustrates a suitable form fitting ring,

Figures 2A and 2B illustrate the ring fitted into a helmet shell,

Figure 3 illustrates a method of securing the ring to the shell,

Figure 4 illustrates the form fitting ring with suspension means,

Figure 5 illustrates a means of securing items of equipment to the form fitting ring, and

Figure 6 represents in diagrammatic form a helmet incorporating the invention fitted with head-up display units.

Referring first to Figure 1, this shows a form fitting ring 1 of expanded polystyrene or polypropylene fitted to a wearer's head 2, the internal surface of the ring being shaped to fit closely around the wearer's head.

Figures 2A and 2B show a front view and side view respectively of the ring 1 fitted into a helmet shell 3. The ring has fitted to it a webbing/netting suspension 4 which fits over the top of the helmet wearer's head and can be adjusted in size to provide height adjustment for the ring 1, and consequently for the helmet. Hook and loop fastener arrangements 12, 13 (see Fig. 3) are provided for detachably securing the ring 1 into the helmet shell 3, the upper part of the internal surface of which carries a fixed attenuation liner 5 of known kind. In order to improve the comfort to the wearer a layer 11 of soft foam padding is applied to the surface of the ring 1 which engages the wearer's head.

A suitable form of hook and loop fastening arrangement is illustrated in Figures 3A and 3B. Such an arrangement, known commonly as Velcro comprises a pair of strips one of which carries on its surface a multiplicity of hooks and the other a multiplicity of loops, such that when the strips are pressed together

the hooks and loops engage to hold the strips together, but can be separated by pulling away from each other. Thus the ring 1 carries one of a pair of such strips on its front surface as shown at 12A, and another on its upper surface of the back as shown at 13A. Complementary strips 12B, 13B are disposed at the front of the helmet shell 3 and the lower surface of the attenuation liner 5 at the rear for engagement with the strips 12A, 13A respectively.

The ring 1 is secured to the helmet shell 3 by first engaging the strips 12A, 12B, with the ring in the position shown by the broken line 15 in Figure 3B and then rotating it upwards as indicated by the arrow to engage the strips 13A, 13B, removal being achieved by reversing the process.

Figure 4 represents a perspective view of the ring 1 and webbing/netting suspension 4; the latter is adjustable by means of a gathering loop fastener 6 at the crown.

Figure 5 shows the attachment to the ring 1 of a nape pad 7 (also illustrated in Figure 2B), and ear cups 8 for accommodating the ear pieces of radio/intercommunication equipment. The nape pad 7 is secured to the ring 1 by means of adjustable webbing loops 9, and the pad carries forwardly extending stiffened webbing pieces 10 on which the ear cups are adjustably mounted.

As previously explained, the invention is primarily intended for use with helmets designed to carry equipment forming part of a head-up display system, and units 14 of such equipment carried by a helmet shell 3 as illustrated in Figures 2A and 2B are shown in diagrammatic form in Figure 6.

On tensioning the helmet on the head the helmet will effectively be pulled back onto the brow of the wearer. As a result of this action a corresponding gap tends to appear at the back of the head through which air may pass into the space above the top of the wearer's head. The ring 1 may also include strategic venting holes (not shown) to aid the passage of air to the scalp.

The principle advantages of the invention are as follows:-

A. It provides a more comfortable helmet fit.

B. It will help to reduce dynamic overshoot (gross movement) of the helmet during an impact cycle, thus limiting the chance any attached display devices may have of contacting the wearer's face.

C. It brings the helmet suspension attachment points close to the wearer's head, thus reducing the "bow-string" effect in helmet webbing systems which attach to the helmet shell, thus making the helmet more stable under "g" loading.

D. Thermal stress is likely to be reduced as air is able to pass around the form fitting ring to the predominantly exposed crown area.

E. It enables a relatively large helmet to be fitted to a small head, thereby allowing a single size of helmet to be used for all wearers.

Claims

1. A helmet comprising a helmet shell (3), and a suspension arrangement for supporting the helmet shell (3) on a wearer's head (2) characterised in that the suspension arrangement comprises a light-weight relatively stiff ring (1), having an internal surface which is matched to, so as to fit closely around, the wearer's head (2), and an external surface which engages a co-operating part of the surface of the helmet shell (3), and means (12, 13) for detachably securing the ring (1) to the shell (3).

2. A helmet according to Claim 1 wherein the ring (1) is formed of a low density plastics material.

3. A helmet according to Claim 2 wherein the ring (1) is formed of expanded polystyrene or polypropylene.

4. A helmet according to any one of the preceding claims wherein the ring (1) carries on its internal surface a layer of a soft padding material (11) to form a cushion against the wearer's head.

5. A helmet according to Claim 4 wherein the padding material (11) is a foam rubber or plastics material.

6. A helmet according to any one of the preceding claims wherein said means (12, 13) for securing comprises a hook and loop fastener system (12, 13).

7. A helmet according to any one of the preceding claims wherein the ring (1) has fitted to it a suspension means (4) of a flexible material which fits over the top of the wearer's head (2).

8. A helmet according to Claim 7 wherein the suspension means (4) incorporates means (6) for adjustment of the size of the suspension means (4), to provide height adjustment for the ring (1) and consequently the helmet.

9. A helmet according to any one of the preceding claims wherein the ring (1) supports ear cups (8) for accommodating earpieces of an intercommunication/radio equipment.

10. A helmet according to any one of the preceding claims wherein the ring (1) supports a nape pad (7).

11. A helmet according to Claim 9 or Claim 10 incorporating means (9, 10) for adjusting the position of said ear cups (8) and/or nape pad (7) to suit the wearer.

12. A suspension arrangement for supporting a shell (3) of a helmet on a wearer's head (2) comprising a light weight relatively stiff ring (1) having an internal surface matched to, so as to fit closely around the wearer's head (2), and an external surface shaped to engage and arranged to be detachably secured to a part of the internal surface of the helmet shell(3).

13. A method of adapting a helmet to fit a particular wearer's head (2) comprising providing a lightweight relatively stiff ring (1) having an internal surface matched to, so as to fit closely around, that particular wearer's head (2), and detachably securing the ring within the helmet.

14. A method according to Claim 13 wherein matching of the internal surface of the ring (11) to the head (2) of the particular wearer is accomplished by custom trimming the inner surface of a common ring blank.

15. A system according to Claim 13 wherein matching of the internal surface of the ring (1) to the head (2) of the particular wearer is accomplished by selection from a number of differently sized rings.

16. A method according to any one of Claims 13 to 15 wherein the ring (1) is formed of a plastics material.

17. A method according to Claim 16 wherein the ring is formed of expanded polystyrene or polypropylene.

Fig.1.

Fig.2A.

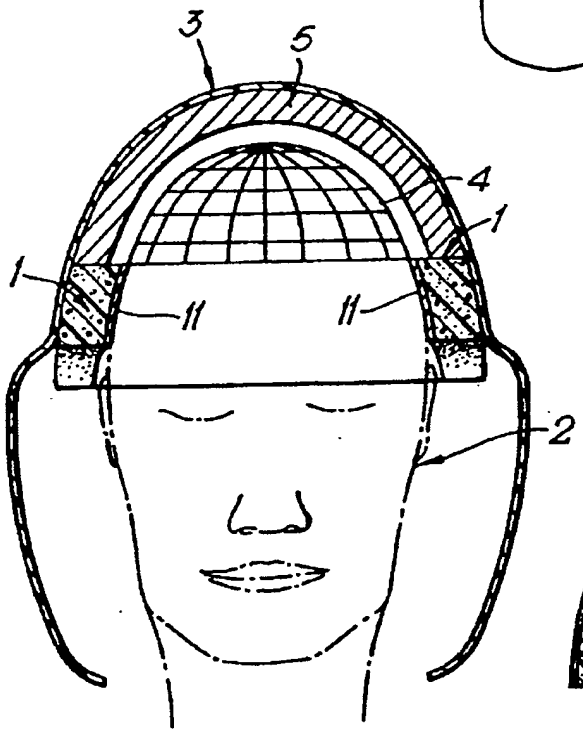


Fig.2B.

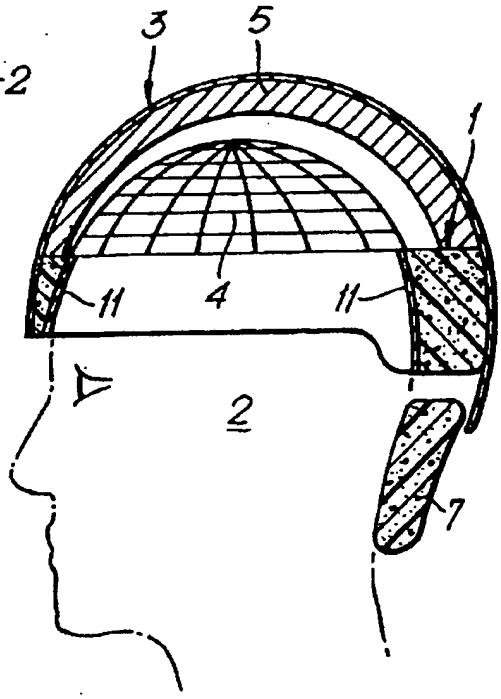


Fig.3.A

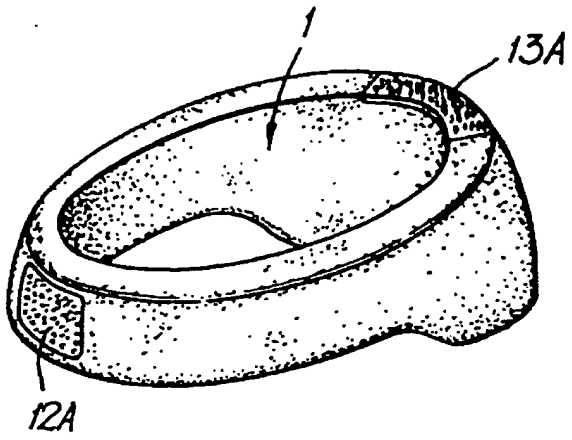
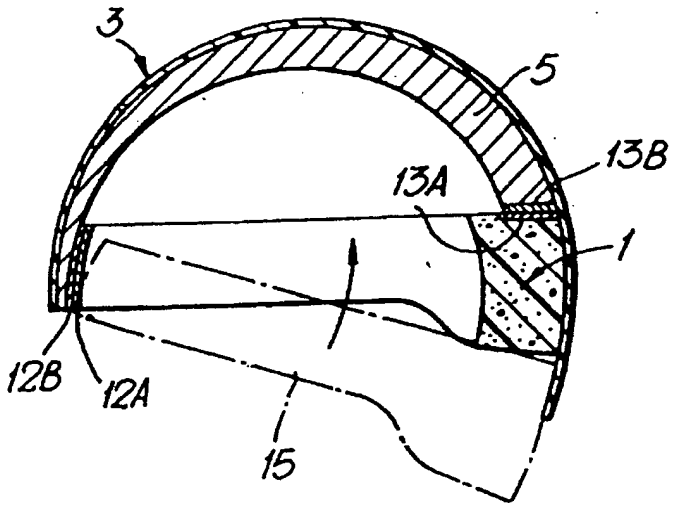


Fig.3.B



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EUROPEAN SEARCH REPORT

Application Number
EP 94 30 1873

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	US-A-3 465 363 (D. F. RANEY) * column 1, line 50 - column 2, line 10 * * column 2, line 44 - line 67 * * column 3, line 25 - line 51 * * figures *	1,2,4,5, 12,13, 15,16	A42B3/10
A	---	3,6,8	
A	FR-A-2 365 971 (R. SIMON) * the whole document *	1-5,7,12	
A	---		
A	US-A-3 577 562 (M. C. HOLT) * claim 1; figures *	1-3,6, 12,13,16	
A	---		
A	DE-U-80 01 638 (HANS RÖMER GMBH & CO) * claims 1,5; figures *	6	
A	---		
A	US-A-3 082 427 (T. ZBIKOWSKI) * column 1, line 60 - column 2, line 25 * * figures *	7,8	TECHNICAL FIELDS SEARCHED (Int.Cl.5)
A	---		A42B
A	US-A-3 852 821 (L. S. MICKEL) * column 2, line 32 - column 3, line 34 * * figures *	10	
A	---		
A	US-A-3 190 973 (J. A. AILEO) * column 3, line 29 - line 42 * * column 4, line 7 - column 5, line 22 * * figure 1 *	9-11	
A	---		
A	US-A-4 345 338 (L. P. FRIEDER, JR. ET AL.) * claim 1; figures *	14	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 July 1994	Bourseau, A-M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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Fig.4.

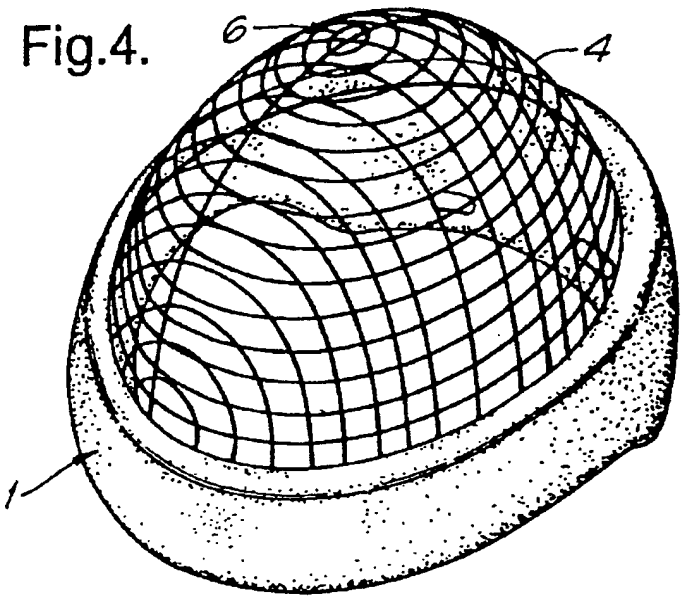

Fig.5.

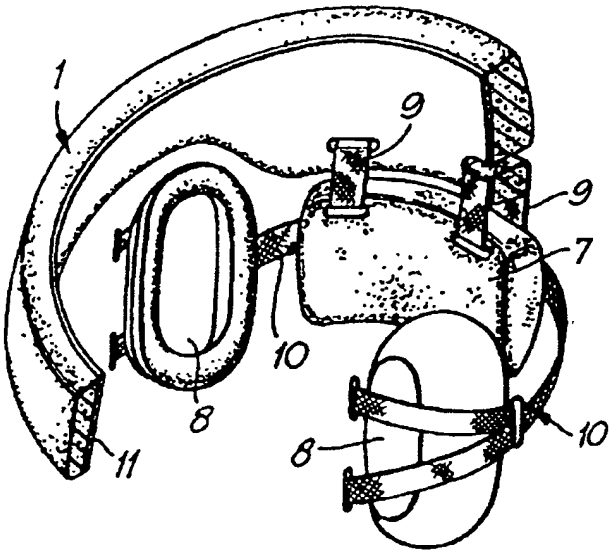

Fig.6.